

# I. OVERVIEW AND OBJECTIVES

The Inventory and Monitoring Program of the Greater Yellowstone Network (GRYN) has completed the second year of its Biological Inventory and the first year of planning for Vital Signs Monitoring. This Annual Administrative Report (FY2002) and draft Work Plan (FY2003) serves to review accomplishments and proposed activities for the GRYN Biological Inventory, Vital Signs Monitoring (VSM) and Water Quality Monitoring Programs. The work plan and budget presented for FY2003 is a draft; the final work plan and budget will be approved and submitted no later than January 31, 2003.

The Greater Yellowstone Network, part of the National Park Service (NPS) Servicewide Inventory & Monitoring (I & M) program, includes four units of the National Park System with significant natural resources: Yellowstone National Park (YELL), Grand Teton National Park (GRTE), John D. Rockefeller National Parkway (JODR), and Bighorn Canyon National Recreation Area (BICA). Administratively GRYN consists of staff, a Board of Directors (BOD), a Technical Planning Committee (TPC), and a Science Committee. Two major functional components of the GRYN are program and data management. The I & M Program Manager for GRYN began work in July 2002 and the data manager position will be filled the first quarter of 2003. Network headquarters were moved from the Yellowstone Center for Resources to the USGS Northern Rocky Mountain Science Center at Montana State University during Summer 2002.

The Biological Inventory Program completed a successful season with the help of cooperators from the Rocky Mountain Cooperative Ecosystem Studies Unit (RM-CESU), Wyoming Game and Fish Department, USDA National Forest Service and the National Park Service. In FY 2002, inventories for herpetofauna, amphibians and exotic plant species occurred across the network while inventories for the distribution and abundance of alpine lake fish species took place in Grand Teton National Park. Amphibian and reptile distribution and abundance in Yellowstone and Grand Teton, funded by the Dept. of Interior Amphibian Research Monitoring Initiative (ARMI), were expanded to include amphibian and reptile surveys in Bighorn Canyon. These inventories were identified in the **Vertebrate and Vascular Plant Inventory Study Plan (2000) for the Greater Yellowstone Network** and will help achieve natural resource goals established in the Servicewide strategic plan.

Also in FY02, GRYN made significant progress in building a strong science foundation and institutional framework to guide us in identifying network wide and park specific Vital Signs for monitoring. The network began building conceptual models, identified its most important related scientific literature resources and completed the second phase of a Delphi scoping process. The 1<sup>st</sup> draft of "phase I" of the VSM plan was completed in September 2002.

In FY 03, two new inventories for small mammals and bats will be initiated while network staff will continue to work with the TPC, BOD and the Science Advisory Committee in planning for the selection of Vital Signs. Also to be implemented in FY 03, and included in the network's overall VSM Plan, will be a Water Quality Monitoring (WQM) plan with clearly stated objectives, rigorous statistical design and monitoring protocols, and a Quality Assurance/Quality Control (QA/QC), data management, and budget plan.

The GRYN objectives for Fiscal Years 02 - 03 follow; accomplishments towards these goals are reviewed in Section II of this report: Accomplishments and Scheduled Activities.

### FY 02 Objectives for the GRYN Biological Inventory Program

1. Hire a Biological Inventory Coordinator to oversee and coordinate network inventory activities.
2. Hire a Cartographic and Database Technician to organize and analyze legacy inventory data.
3. Document, through existing, verifiable data and targeted field investigations, the occurrence of at least 90 percent of the species of vertebrates and vascular plants currently expected to occur in Bighorn Canyon National Recreation Area, Grand Teton National Park, and Yellowstone National Park.
4. Describe the distribution and relative abundance of species of special concern, such as threatened and endangered species, non-native species, and other species of special management interest occurring within park boundaries.
5. Provide the baseline information needed to develop a general monitoring strategy and design that can be implemented by parks once inventories have been completed, tailored to specific park threats and resource issues.
6. Make information easily available to park managers, resource managers, scientists, and the public.

### FY 02 Objectives for the GRYN Vital Signs Monitoring Program

7. Establish an administrative and organizational framework for the GRYN VSM and WQM Programs.
8. Prepare a timeline of VSM and WQM activities for FY 01 and FY 02.
9. Integrate the Biological Inventory program into VSM activities.
10. Create a list of current and historic monitoring programs in GRYN network parks.
11. Develop an FY 01 water quality monitoring work plan as part of the overall VSM study plan.
12. Evaluate the relationships of individual parks to wider ecosystem issues and determine value of developing ecosystem models that include individual park contributions and significance to overall ecosystem health.
13. Assemble and summarize information about monitoring strategies, activities, and networks, at all political and biological levels that could impact or influence the natural resources within GRYN network parks.
14. Determine park and network vital resources, vital water quality parameters, and overall network priorities for VSM and WQM projects for each park in the network using the Delphi Process decision-making methodology. Hold a network-wide monitoring workshop to develop VSM and WQM design plans, budget, implementation strategy, and database management plans.

### FY03 Objectives and scheduled activities for the GRYN Biological Inventory Program

1. Make information easily available to park managers, resource managers, scientists, and the public.
2. Describe the distribution and relative abundance of vertebrate and vascular plant species of special concern, such as threatened and endangered species, non-native species, and other species of special management interest occurring within GRYN park boundaries.
3. Develop an institutional framework for governing and overseeing the administration of the Biological Inventory Program.

### FY03 Objectives and scheduled activities for the GRYN Vital Signs Monitoring Program

4. Maintain an administrative and organizational framework for the GRYN VSM and WQM Programs.
5. Identify network Vital Signs and monitoring the health of GRYN and prepare monitoring objectives by September 2003.

6. Prepare synoptic reviews on selected vital indicators to evaluate existing data sets and monitoring approaches.
7. Develop a data management plan for the network.
8. Communicate our program with professional standards of writing, reporting and data analysis

#### FY03 Objectives and scheduled activities for the GRYN Water Quality Monitoring Program

9. Hold water quality planning workshops
10. Identify and acquire published resources on water quality monitoring and examples of water quality monitoring templates and strategies
11. Conduct data mining, database review, and compilation and analysis of existing water quality data.
12. Develop water quality monitoring objectives for each park
13. Develop monitoring protocols.
14. Develop QA/QC protocols for water quality plans

## **II. ACCOMPLISHMENTS AND SCHEDULED ACTIVITIES**

### **FY 02 ACCOMPLISHMENT REPORT FOR THE GRYN BIOLOGICAL INVENTORY PROGRAM**

#### **1. Hire a Biological Inventory Coordinator to oversee and coordinate network inventory activities.**

FY02 Accomplishments: In July 2002, the Inventory Coordinator left the GRYN to take a permanent position as the I&M Coordinator for the Mediterranean Coast Network. The incoming I & M program manager (Cathie Jean) delegated the responsibilities of the Inventory Coordinator to existing network staff.

#### **2. Hire a Cartographic and Database Technician to organize and analyze legacy inventory data.**

FY02 Accomplishments: Network technicians Chad Jacobson and Pat Flaherty made substantial progress organizing legacy inventory data sets. Network wide, 222 new records were added to Dataset Catalog (this number includes monitoring datasets as well). All catalog records were checked and corrected for completeness and accuracy. In conjunction with this effort, related NatureBib entries were made. Reference data for Yellowstone and the region was shared by Ms. Cynthia Kaag of Washington State University's Library, integrating her many years of work into NatureBib. The literature review, completed by network staff, generated nearly 100 new entries for addition to NatureBib as well. The NPSpecies database was significantly updated several times during the year by adding vascular plant voucher records (300 BICA and 842 GRTE), 797 wildlife observation records (BICA) and abundance information for 12 mammals in GRTE. Base Geographic Information System (GIS) layers and corresponding metadata were generated and maintained for network-wide spatial display and analysis. Eight new GIS themes were also created and acquired from ongoing inventory project datasets as they became available.

#### **3. Document, through existing, verifiable data and targeted field investigations, the occurrence of at least 90 percent of the species of vertebrates and vascular plants currently expected to occur in Bighorn Canyon National Recreation Area, Grand Teton National Park, and Yellowstone National Park (Table 1).**

FY02 Accomplishments: Wyoming Natural Diversity Database (WYNDD) at University of Wyoming

was issued a task agreement through the RM-CESU to complete inventories for mammals in BICA and for bats across all GRYN parks. Prior to his departure, the GRYN Inventory Coordinator worked closely with WYNDD as they prepared their survey design proposal. As the bat and small mammal inventories involve the collection of voucher specimens, network staff began making contacts and examining alternatives for a permanent network vouchers repository. In addition, the first use of the on-line research permit system was initiated for BICA.

**Table 1. Inventory and schedule of activities planned and implemented between FY 2001-2003.**

Project name	2001			2002			2003		
	BICA	GRTE	YELL	BICA	GRTE	YELL	BICA	GRTE	YELL
Non-Native Vascular Plant Inventory	✓	✓	✓	✓	✓	✓	✓	✓	✓
Rare Vascular Plant Inventory		✓							
Amphibian & Reptile Inventory	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bald Eagle & Sage Grouse Survey		✓			✓			✓	
Vascular Plant Inventory	✓								
Vascular Plant Inventory (Alpine)	•								✓
Alpine Lakes Fish Inventory					✓			✓	
Bat Inventory				✓	✓	✓	✓	✓	✓
Mammal Inventory				✓			✓		
<div style="display: flex; align-items: center;"> <div style="width: 15%; text-align: center;"> <div style="background-color: #cccccc; width: 20px; height: 10px; margin: 2px auto; display: flex; align-items: center; justify-content: center;">✓</div> <div style="background-color: #cccccc; width: 20px; height: 10px; margin: 2px auto; display: flex; align-items: center; justify-content: center;">✓</div> </div> <div> <p>Bat and small mammals funded in 2002 and inventory scheduled in 2003</p> <p>Bald Eagle &amp; Sage Grouse Survey postponed by one year due to staff changes</p> </div> </div>									

**4. Describe the distribution and relative abundance of species of special concern, such as threatened and endangered species, non-native species, and other species of special management interest occurring within park boundaries.**

FY02 Accomplishments: In FY02, the GRYN continued to inventory the distribution and abundance of non-native vascular plants and amphibians and reptiles. Inventories for amphibian and reptiles continued under the principal investigators Deb Patla and Chuck Peterson, of Idaho State University in all three parks. For a second year, I & M dollars were leveraged with funds ARMI to complete inventories in FY02. While the Rocky Mountain transect of the ARMI monitoring design includes both YELL and GRTE but excludes BICA, cooperators worked to add BICA to their inventory design. Inventories completed in 2002 also included funding leveraged from Grand Teton Natural History Association.

At Yellowstone, investigators Bruce Maxwell and Lisa Rew implemented a probabilistic survey design in Yellowstone's Northern Range. This inventory will provide both the distribution and abundance of non-native vascular plants and will also yield data to predict the distribution of non-native plants in backcountry locations. At GRTE, the survey design was applied to the valley floor and seasonal park staff, supervised by Steve Haynes, implemented the inventory. At BICA, I&M program dollars were

leveraged using funds from the RM-CESU and NRPP to map exotic plants. Dr. Roger Sheley, principal investigator on this project, in cooperation with Lisa Rew, used network monies to leverage other NPS funds for this work that will begin in FY 03.

Wyoming Fish and Game Department completed the first year of a two-year fish inventory of alpine lakes at GRTE. Fourteen alpine lakes were inventoried and Yellowstone Cutthroat Trout were found in two of these lakes. In conjunction with the fish survey, investigators from the University of Montana (UM) collected water chemistry at a number of alpine lakes in GRTE, as protocol development for water quality vital signs. This UM project leveraged money from RM CESU and Intermountain Region (IMR) Natural Resources.

Also, the GRYN has populated NPSpecies and used this database to track the status of plant and animal species of concern.

## **5. Provide the baseline information needed to develop a general monitoring strategy and design that can be implemented by parks once inventories have been completed, tailored to specific park threats and resource issues.**

FY02 Accomplishments: GRYN made substantial progress identifying and assembling baseline information to help design a monitoring strategy. An introduction and overview of this material was prepared for Chapter II of the Vital Signs Monitoring Plan.

- ◆ Tables of park specific historic and current monitoring projects were completed for each of the network parks. Brief paragraphs were prepared for each substantive monitoring project; this text makes up the Current and Historic Monitoring section of the phase I report.
- ◆ The Servicewide strategic plan and park specific Government Performance and Results (GPRA) goals relevant to vital signs monitoring were obtained and considered in the phase I report.
- ◆ GRYN helped fund a boundary stressor project that identified specific locations and type of mining claims, oil & gas leases, and geothermal leases on lands adjacent to the network parks. Most of the activity is concentrated north of Yellowstone or south of Big Horn Canyon. For example, just south of Big Horn Canyon, within 20 miles of the park, there are 208 placer claims, 133 oil & gas leases, four load claims, and two mill site claims. This project is 2/3 complete for the area surrounding the network. The completed GIS theme will be used as part of Vital Signs planning.

In addition to collecting existing data, GRYN helped obtain infrastructure to support the acquisition of new baseline data. .

- ◆ GRYN purchased a weather station to be installed at BICA in FY03. Basic weather data are needed to allow comparison with other network parks as well as provide important metadata for other vital signs. Weather data will be transmitted via satellite and available by Internet at <http://raws/boi.noaa.gov/>.
- ◆ An interagency agreement with USGS to collect snow chemistry data and assemble 'deposition map' for GRTE and YELL was initiated to help assess atmospheric stressors. This project included leveraged funds from the NPS-Air Resources Division.
- ◆ A mercury deposition monitor was installed at YELL (part of NADP-MDN) to assess mercury as an atmospheric deposition threat.

## **6. Make information easily available to park managers, resource managers, scientists, and the public.**

FY02 Accomplishments: Network staff have given program briefings and informational talks to a number of partners and collaborators. These talks helped communicate the objectives and goals of the I&M program and frequently made reference to information (Dataset Catalog, NPSpecies, NatureBib) that is available to interested parties.

Specific presentations included:

- ◆ September 2002. GRYN Science Committee meeting. Introduction and planning for VSM program.
- ◆ June 2002. Non-native vascular plant species inventory & survey design. An informative talk presented to YELL Ranger division by Lane Cameron.
- ◆ July 2002 and August 2002 GRYN overview. An oral progress report given at the Intermountain Region I&M and later the national meeting in Denver by Cathie Jean
- ◆ October 2001. Informative presentation on the I&M program given to the GRTE Division Chiefs by Dr. Robert Schiller.
- ◆ November 2001. Network water quality planning presentation given at the Water Resource Division (WRD) meeting by Susan O'Ney.

## **FY 02 ACCOMPLISHMENT REPORT FOR THE GRYN VITAL SIGNS MONITORING PROGRAM**

### **7. Establish administrative and organizational framework for the GRYN WQM and VSM programs:**

FY02 Accomplishments: The I&M Program Manager, Cathie Jean, began work in August 2002. Her office is located with USGS Northern Rocky Mountain Science Center at Montana State University, housed through the USGS and the RM-CESU. NRMSC reserved office space for the program at the Forestry Science Lab on campus. An interagency agreement was completed between the network and USGS to help finance the office lease, and University telephone and computer services.

The network received a unique organization accounting code for I&M and WQM and all previous accounting codes were transferred to the new code. The network budget was moved from the Intermountain Region to YELL to increase the accountability of the network. Colleen Watson, budget assistant supported with \$12,000 of I & M funds, provided administrative support for the budget from her duty station at the Yellowstone Center for Resources.

One-and-a-half staff positions were filled during FY 02: one 0.5 FTE (GS9/11) position at GRTE and at BICA, one FTE (term GS9/11) position. The program manager supervises these network positions and a Memorandum of Understanding (MOU) between the network at these parks is being developed to ensure that funds' supporting these positions complies with administrative guidance for I & M funds.

Greater Yellowstone Network was the first IMR network to form a Science Committee (SC), including some of the most reputable scientists who have worked in our parks. The network BOD and TPC prepared a role and function statement for the SC, five individuals were selected for membership, and the first meeting was held in Jackson, WY in late September 2002. An orientation and introduction to the I&M program as well as GRYN was provided by Steve Fancy, National I&M Coordinator, and Cathie Jean, GRYN Program Manager. GRTE park superintendent Steve Martin and YELL Assistant Superintendent Frank Walker were also in attendance and participated in vital signs discussion and planning.

Two network staff left the network in 2002. The Inventory Coordinator, Lane Cameron transferred to the Mediterranean Coast Network, and the Cartographic Technician Patrick Flaherty transferred to Pinnacles NM.

Administratively, many organizational details regarding permits, NEPA compliance and voucher specimens were addressed by the network. Use of the U.S. National Park Service Research Permit and Reporting System got underway for the first time at BICA (GRTE and YELL began using the automated RPRS in 2001) and efforts are in progress to determine the most appropriate repositories for voucher specimens produced during both current biological inventory and future monitoring efforts.

## **8. Prepare a timeline of VSM and WQM activities for FY01 and FY02.**

FY02 Accomplishments: A timeline was prepared at the winter network meeting in Jackson, WY on February 27 and 28<sup>th</sup>. Later changes in personnel required an adaptive approach to planning for Vital Signs. One important change involved the development of conceptual models and the completion of an annotated literature review before the network continued with the Delphi III scoping process. Importantly, a plan was developed to more deliberately engage park staff in the scoping and planning for the VSM.

The planning process and how to engage the SC were subjects at the September meeting. The TPC drafted a process and a schedule for identifying vital signs in 2003; these documents will be refined in early FY03. Each component of the planning process is included in the FY03 workplan.

## **9. Integrate the Biological Inventory program into VSM activities.**

FY02 Accomplishments: The departure of the inventory coordinator resulted in both inventory and monitoring functions being integrated under the management of the I&M Program Manager. Responsibilities for biological inventory projects were assigned to existing network staff (rather than rehire the term inventory coordinator). The TPC continue to be involved with planning and budgeting of the Inventory, VSM and WQM programs and the BOD continues to approve these plans and budgets. In FY03 we will reform the BOD to include the two superintendents (GRTE and BICA), the Assistant Superintendent (YELL), the RM-CESU representative and the IMR I & M coordinator.

## **10. Create a list of current and historic monitoring programs in GRYN network parks, obtain data, and integrate into appropriate database format.**

FY02 Accomplishments. Lists of current and historic monitoring programs were used to identify datasets to be entered into the Dataset Catalog. Existing records were updated to current standards. GRYN now has 719 datasets (476 Yell, 131 GRTE and 114 BICA) with potentially useful data for monitoring. These records are at least 75% complete with the purpose field absent for most records. At YELL, datasets were stratified by priority to divide the workload. Forty-one high priority datasets were identified and emphasis was placed on ensuring the completeness and accuracy of these records. Several important datasets were identified by park staff and analysis of these data sets have been proposed for funding by the network.

## **11. Develop a FY01 water quality monitoring work plan as part of the overall VSM study plan.**

FY02 Accomplishments: Accomplishments for this objective are reported beneath the section titled 'FY02 Accomplishment Report for WQM Program.

**12. Evaluate the relationships of individual parks to wider ecosystem issues and determine the value of developing ecosystem models which assess individual park contributions and identify significance of park to overall ecosystem health:**

Dr. Duncan , Montana State University, through a RM-CESU task agreement for \$22,793.00, helped the network complete a first set of draft Conceptual Models. Duncan worked closely with park staff to solicit feedback and choose submodels. Three different models were involved: the first two models are hierarchical, comprehensive ecosystem models illustrating the complex interrelationship between resources whereas select submodels illustrate specific elements of the comprehensive model. The third model depicts examines the spatial and temporal importance of ecological indicators. The conceptual models are included in the 1<sup>st</sup> draft of the phase I VSM plan.

Ecological stressors were identified and reported in the phase I report. Agents that change the abundance, distribution or resiliency of park natural system resources are thought to be significant. Two separate exercises, the first and second rounds of GRYN Vital Signs Delphi Survey and conceptual modeling by Patten et.al, generated lists of ecosystem stressors. In addition, descriptive paragraphs of park specific management and scientific issues were developed for the Phase I report

**13. Assemble and summarize information about monitoring strategies, activities, and networks, at all political and biological levels, that could impact or influence the natural resources within GRYN network parks.**

The GRYN held two water quality workshops in FY02, both with broad interagency participation. These activities are further described in 11.1.

The GRYN supported two efforts related to water quality monitoring in order to closely examine the application for Vital Signs monitoring and evaluate existing protocol. The Yellowstone aquatic macro-invertebrate inventory was expanded to include BICA and GRTE. Seasonal employees under the direction of Jeff Arnold, Yellowstone Aquatic Ecologist, completed inventory for macro-invertebrates at several monitoring stations across the network. Add details including Jeff's water quality work.

GRYN also supported an ecosystem wide stream reference reach inventory that was partially funded by the Greater Yellowstone Coordinating Committee. An interagency agreement was completed to transfer funds to the Beaverhead – Deerlodge National Forest for this project. The scope of the original project was changed, somewhat, to include sites at BICA.

**14. Determine park and network vital resources, vital water quality parameters, and overall network priorities for VSM and WQM projects for each park in the network using the Delphi Process decision-making methodology.**

Round II of the Delphi questionnaire was completed and a report delivered to the network in June 2002. The Delphi survey was used to elicit input on potential vital signs from park staff and other experts. Unfortunately, the Department of the Interior shut down DOI Internet activities while Round II was in progress, causing a several month delay in both the questionnaires availability and results. More importantly, DOI employees without Internet may have missed Round II of the questionnaire.

Delphi II asked participants to rank the top 5 important ecological indicators and comment on which indicators each park should monitor. Initial results indicate that the Delphi process will be a valuable



tool to help illuminate ecological indicators, but will not replace the need for park involvement in setting priorities for the network.

A review of literature most pertinent to our understanding of the ecosystems and physical characteristics of the GRYN parks was conducted during the last quarter of FY 02. A wide variety of subject area experts from within and outside the parks were contacted and their input was used to screen a wide body of literature for the Yellowstone Ecosystem into a smaller list of the most important works. An annotated bibliography is planned for the first quarter FY 03 which will be included in the VSM plan.

#### **15. Hold a network-wide monitoring workshop to develop VSM and WQM design plans, budget, implementation strategy, and database management plans.**

The network held a number of network wide meetings to develop annual plans and budgets and make decisions on strategic planning for VSM.

- ◆ October 2001 – Yellowstone NP. Topics include discussion of ecosystem models and sub-models. Frank Walker, Assistant park superintendent for YELL participated in the Vital Signs discussion.
- ◆ February 2002 – Grand Teton NP. Topics include Vital Signs Monitoring. GRTE staff participated in the discussion.
- ◆ June 2002 – Missoula, MT. Topics include review of Delphi II results and planning for literature review.
- ◆ July 2002 – Bozeman, MT. Co-sponsored with USGS NRMSC. Topics include park superintendent view and discussion of USGS /NPS research and monitoring in Yellowstone NP. Superintendent Suzanne Lewis was in attendance.
- ◆ September 2002 – Moose/Jackson, WY. SC meeting with the TPC, BOD, network staff and Superintendents Steve Martin (GRTE), assist. Superintendent Frank Walker (YELL) and the national I & M coordinator Steve Fancy participating in the discussion of vital signs planning for the network.

In addition, a task agreement through the RM-CESU for \$173,500 to secure workshop and meeting facilities (University conference services), equipment and supplies (non computer) and student support to the network over a three year period was completed with Big Sky Institute at Montana State University.

## **FY 02 ACCOMPLISHMENT REPORT FOR WATER QUALITY MONITORING PROGRAM**

### **11. Develop a water quality monitoring work plan as part of the overall VSM study plan:**

#### **11.1 Hold informal network-wide meetings with resource managers that are actively involved in maintaining resource water quality within network park**

FY02 Accomplishments: The network held two water quality planning meetings. The first meeting was held in Missoula, MT in December 2001, and was hosted by the RM-CESU. The meeting had broad representation from network parks and WRD staff including Bill Jackson, Gary Rosenleib and Mike Matz. At this meeting, the group reviewed and discussed the Servicewide GPRA WQ goal 1a4 and park responses to the water quality questionnaire sent to the network parks. In addition, the group discussed

the scope of work for the task agreement with Scott Woods at the University of Montana for the water quality data mining activities and database review.

The second meeting was organized by Susan O'Ney and held in June 2002 in Gardiner, MT. This meeting was attended by representatives from the USDA Forest Service, Environmental Protection Agency (EPA), US Geological Survey (USGS), WY Department of Environmental Quality (WYDEQ) and the Teton Conservation District as well as representative from the network parks and Bill Jackson (WRD). Topics included in-depth reviews and critiques of the different agency's water quality monitoring strategies (National Water Quality Assessment (NAWQA), Beneficial Use Recommended Protocols (BURP), Environmental Monitoring and Assessment Program (EMAP), Inland Western Watershed Initiative (IWWI)), including rationales for both random and fixed site sampling schemes. The group also focused on ways the GRYN can enhance partnerships with neighboring agencies, and discussed laboratory options for water quality and macro-invertebrate sample analysis. Also, Scott Woods and Jennifer Corbin presented the results of their review of available network water quality data. Maps and handouts were provided to each of the network parks that summarized historic water quality monitoring and made suggestions for future efforts.

### **11.2 Identify and acquire published resources on water quality monitoring that could be of specific use in planning monitoring activities.**

FY02 Accomplishments: The program acquired several new books on water quality monitoring and also obtained water reference documents from state programs in Wyoming, Montana and Idaho.

### **11.3 Conduct data mining and database review activities to determine the status of active and historic water quality monitoring within the parks of GRYN.**

FY02 Accomplishments: Considerable progress was made in identifying water quality datasets available for each of the network parks and assuring each dataset was entered into Dataset Catalog. The number of water quality data sets in Dataset Catalog was doubled to 26.

Dr. Scott Woods and his graduate student, Jennifer Corbin, made substantial progress on the review and analysis of water quality data for the network. Woods began work on this task order November 1, 2001. He presented his initial results at the water quality workshop in June 2002. Following the June meeting, a second task agreement was issued to Woods to acquire, and add to his analysis, recently collected data from Soda Butte, a 303d listed stream in Montana. This additional analysis will include the identification of trends and estimates of variability for several of NPS identified "core variables" for each of the network parks.

### **11.4 Develop and populate a relational database for WQ monitoring data identified and acquired as a result of step 11.3.**

FY02 Accomplishments: Part of the task agreement with Dr. Scott Woods required the development and population of a relational database to house GRYN water quality data. Although developed in 2002, the network will not acquire the database until the project is complete in December 2003. Water Resource Division staff in Fort Collins provided Dr. Woods with NPS Horizon data from each of the network parks. These data were updated (through 2001) with data from the new EPA STORET and the USGS NWIS databases. Each of the network parks provided Dr. Woods with additional local (park specific, water quality related) datasets that were felt to be valuable to his analysis.

### **11.5 Begin compiling existing water quality data, and begin an analysis of the adequacy of current monitoring (by NPS or others).**

FY02 Accomplishments: Most of our accomplishments on this objective are reported beneath 11.3 and 11.4. The network commissioned Dr. Woods at University of Montana through two RM-CESU task agreements totaling \$32,000 (\$17,000 in FY02) to analyze water quality data and the adequacy of current water quality monitoring programs in the network.

YELL recorded the exact locations of ground water monitoring locations using GPS in FY01 & FY02 (non I&M funds). No similar activity occurred at GRTE in FY02 since ground water monitoring is not the focus of the WRD water quality program.

### **11.6 Identify examples of monitoring templates, and strategies used by other networks, prototype parks, or regulatory agencies.**

FY02 Accomplishments: Water quality monitoring strategies and protocols were downloaded from the Internet for the following water quality programs: EPA EMAP, WYDEQ BURP and USGS NAQWA.

Although network staff was unable to attend the Teton Conservation District (TCD) meeting, a PowerPoint presentation summarizing the NPS Vital Signs program as it relates to water quality monitoring was presented by Randy Williams, Executive Director TCD at the meeting. Network staff remain on the TCD mailing list and continue to be involved on a local level. The network did not take advantage of specific protocol training offers, as this seemed premature until a monitoring plan has been developed. Another offer, from Robert Swanson (USGS), was extended to the network to help develop NAQWA training specific to Park Service needs.

### **11.7 Identify and contact 2-3 monitoring networks, prototype parks with well established monitoring programs, state or federal agencies, and/or University Research Programs in Hydrology/Water Quality that would be willing to provide guidance and act as a sounding board in the development of the GRYN monitoring plan.**

FY02 Accomplishments: Members of the GRYN attended the WRD water quality meeting in Ft. Collins in November 2001. At this meeting, contacts were initiated with other networks. Information was obtained from the Northern Colorado Plateau I&M network. They are working with investigators from Colorado State University to develop a WQM plan. Agency contacts were established at the water quality workshop in June 2002. At this meeting, experts from the EPA, USGS and state agencies offered continued assistance to the program. To further explore the EPA methods and protocols, a GRYN employee attended the EMAP symposium on The Condition of Our Nation's Streams & Rivers from the Mountains to the Coast at Kansas City Missouri, May 7-9, 2002.

### **11.8 Compile information on state-identified "impaired" (303d-listed) waters within network parks.**

FY02 Accomplishments: A GIS theme with 303d-listed waters was used to create a map distributed at the November 2001 water quality meeting. This theme has since been updated with current 303d data and associated metadata.

### **11.9 Compile information on state-identified outstanding waters, or special protection waters.**

FY02 Accomplishments: All waters in GRTE and YELL are considered Class 1 waters by Wyoming DEQ. This Class 1 designation corresponds with EPA's Tier 3 classification for Outstanding Natural Resource Waters. Stressors and potential threats to these water bodies were identified using a questionnaire sent to the parks and later discussed at the November water quality meeting. There are no special protection waters or state identified outstanding waters within network parklands in Montana or Idaho.

**11.10 Compile information on other water bodies in the network not officially recognized as such, but that are thought to be both pristine and ecologically highly significant at the park or network scale.**

FY02 Accomplishments. Ecologically significant water bodies were identified using a questionnaire sent to the parks. These water bodies are listed in the Phase 1 report.

**11.11 Identify ecologically significant "stressors" that have the potential to impact water quality within network parks.**

FY02 Accomplishments: A questionnaire sent to individuals within the network parks, the Delphi Internet based decision process, and a task agreement with Dr. Scott Woods were all used to help identify ecologically significant stressors that have the potential to impact water quality with the network. The results from the questionnaire were discussed and additions made at the water quality meeting in December. These stressors are included in phase I report and conceptual models.

**11.12 Use compiled information in conjunction with results of the Delphi process (see below) to develop a strategy for developing the WQM study plan.**

FY02 Accomplishments: Dr. Woods' report recommended several strategies for developing GRYN's WQM study plan. Additional strategies were discussed by various agency and network representatives at the June 2002 water quality planning meeting in Gardiner, MT. Because the Delphi process has not yet been completed, results have not been incorporated into other network strategies.

## **FY03 SCHEDULED ACTIVITIES FOR INVENTORY PROGRAM**

- 1 Develop and implement a plan that communicates the mission and accomplishments of the GRYN program with professional standards of writing, reporting and data analysis**
  - 1.1 Prepare a communication plan for the network that identifies specific tasks that will communicate the goals and purpose of the GRYN in an efficient and consistent manner. The Communications Director (described in task 5.2) will prepare the plan and provide communication products such as a network logo, letterhead and memorandum.
  - 1.2 Prepare and publish Biological Inventory and Vital Signs planning reports and other products and ensure each I&M report or publication is delivered to each Network Park, the I&M program manager, the Intermountain Region I&M Coordinator and also is entered into NatureBib if relevant.
  - 1.3 Design and launch a web site where park staff, scientific communities and the public sector (with consideration of sensitive data availability) can learn more about the GRYN and obtain copies of study products, reports and publications.
  - 1.4 Remain updated as to other networks and/or parks successful methods of providing gathered information.

- 2 **Develop and implement a data management plan for the network (including both inventory and monitoring components of the program)**
  - 2.1 Prepare a draft data management plan that includes strategies for network wide data sharing and archiving.
  - 2.2 Assemble a data management workgroup to inventory and compile existing GIS themes, identify data gaps, secure high priority spatial data and advise on network database projects. Support for data management activities will come from Ann Rodman (YELL) until a data manager is hired. Ann will chair the data management workgroup and will oversee the acquisition and development of priority data sets and assist day-to-day data management activities and projects described below; her time devoted to network activities is approximately 4 pay periods (including time on technical committee and workshop participation). Cartographic technicians, supervised by Ann at YELL will be complete the GIS data development and acquisition activities and provide map support until the network office has ArcInfo operating capabilities.
  - 2.3 Complete a review and certification of the NPSpecies Database (according to Servicewide standards) for accuracy and completeness. Coordinate with technical planning committee on network definition of 'species of special concern' and code NPSpecies accordingly.
  - 2.4 Develop an action plan for quality control and updating NatureBib. Review and correct entries and edit/correct to comply with data standards. Archive and/or delete records that are duplicate, incomplete or inappropriate. Fill in topic data gaps identified during literature review and as new publications become available.
  - 2.5 Develop Standard Operating Plans for efficient data capture. Assign data management staff to visit each network park to gather and input new records into NatureBib, NPSpecies and Dataset Catalog as appropriate.
- 3 **Describe the distribution and relative abundance of vertebrate and vascular plant species, targeted species, taxonomic groups and/or species assemblages that are of special concern to GRYN network parks.**
  - 3.1 Implement inventory projects identified and scheduled in the Vertebrate and Vascular Plant Inventory Study Plan. These projects include: exotic vascular plants, and bat, amphibian & reptile inventories at each Network Park, bald eagle & sage grouse surveys and alpine lakes fish inventories at GRTE, a mammal inventory at BICA and an alpine vascular plant inventory at YELL. The exotic plant inventory at GRTE will be completed using seasonal employees, under the supervision of Steve Haynes, following North American Weed Mapping Association protocol. The network will arrange park housing for cooperators in BICA and GRTE and in YELL, where park housing is not available, the network will arrange for lodging in Gardiner MT.
  - 3.2 Sponsor an exotic plant species workshop to share information about current exotic species inventories in the network; create a framework for communication and coordination between these efforts and to evaluate inventory progress and compliance with data standards.
  - 3.3 Conduct standard analyses of data and present the results of such analyses as background material in VSM plan and make available for VS planning workshops.
- 4 **Develop an institutional framework for governing and overseeing the administration of the Biological Inventory Program**
  - 4.1 Assure adherence to established NPS Servicewide and generally accepted scientific standards, including quality assurance and quality control on inventory data and reports.
  - 4.2 Assure adherence to established Servicewide fiscal, NEPA and other compliance, data management and reporting standards.
  - 4.3 Establish a network contact for each study who, acting as an Inventory Coordinator, will assist in the management of the project. Provide time for substantial involvement and seek considerable

technical assistance from within and outside of the NPS in all phases of each study: establishment of goals and objectives, protocol development, field data collection efforts and subsequent data analysis, and report writing and distribution of final technical reports.

- 4.4 Establish templates for products, such as progress and final reports and ensure deliverables follow the template.
- 4.5 Establish data storage, archival headquarters and/or an institutional library for the network. Establish permanent institutional repositories for voucher specimens collected.
- 4.6 Update the network Charter and allow for 30 days review by Board of Directors and Technical Planning Committee. Deliver a fully executed copy to the Servicewide and Regional I&M Program Managers.

## **FY03 SCHEDULED ACTIVITIES FOR VITAL SIGNS MONITORING PROGRAM**

### **5 Maintain an administrative and organizational framework for the GRYN VSM and WQM Programs.**

- 5.1 Increase staffing to handle major programs of work. Recruit for Data manager and Quantitative Ecologist during the first quarter of FY03 and hire in the second quarter. The network will acquire the services of a professional writer/editor and graphic designer to assist with the production of Phase II of the Vital Signs Monitoring Plan. The writer/editor will work with the program manager and contributing authors to organize and edit and deliver the plan as a finished product. A graphic artist will be commissioned to develop figures for conceptual model chapter and power point presentations.
- 5.2 Hire Anne Schrag as a part time temporary Communications Director for the network using funds in an existing task agreement with Big Sky Institute at MSU. This individual will be responsible for workshop planning, logistics implementation and for preparing reports on workshop results. Solicit for cost estimates and present materials to contracting officer to obtain a professional services contract for a facilitator. Anne will arrange for workshop facilities, prepare invitation list, make travel arrangements, and arrange for note takers. She will work closely with Olliff and Jean to design workshop program and objectives. Anne will also develop a communications plan (see task 1.1)
- 5.3 Detail Glen Plumb into the network for 90 days to lead the completion of Chapter III of the VSM plan and assist in the development of a Decision Support System (DSS) to select and prioritize indicators for monitoring presented in Chapter IV. This activity is further described in tasks 6.1 thru 6.8. Glenn's contributions go beyond the period of this detail and the network is helping fund non-permanent employees to fill behind Glenn for his participation outside the period of detail.
- 5.4 Complete MOUs between the network and BICA and GRTE where network employees are duty stationed to ensure that funds supporting these positions comply with administrative guidance for I & M funds and to establish standard operating procedures for employee time, travel and purchasing.
- 5.5 Move office facilities from Mammoth, WY to Bozeman, MT using the services of a moving company. Inventory and consolidate computer files and then duplicate database, GIS and user directories to network server in Bozeman. Steve Miller, computer systems administration for Yellowstone Center for Resources will work two pay periods for the network to physically move computers, install Cisco Systems VPN client software for secure computer access, install the network server and back-up procedures at the Forestry Sciences Lab, configure NPS computers to comply with security certification requirements and take care of routine systems

administration tasks. Transfer property records to Intermountain Support Office (ISO). Prepare an interagency agreement with Northern Rocky Mountain Science Center (USGS) to pay for facilities at the Forestry Sciences Center at Montana State University.

**6 Identify and prioritize all terrestrial and aquatic indicators then develop protocols and implement programs to monitor Vital Signs.**

- 6.1 Continue conceptual model development with the objective to integrate the models with a narrative literature review that will serve to guide the selection of candidate indicators and permit filtering, rank-ordering and prioritization of selected Vital Signs. Regional experts on riparian and terrestrial vegetation and aquatic ecosystems will contribute to the text which will explain our understanding of ecosystem drivers, stressors and ecosystem effects and outcomes that indicate the health or impairment of GRYN Network Parks. Dr. Duncan Patten, Big Sky Institute, will continue working with the network on conceptual models and will also participate in the park specific and Vital Signs workshops as part of the core planning group responsible for the communicating the process and outcomes relevant to vital signs selection. Dr. Bob Hall (aquatic ecologist) and Dr. Dan Tinker (terrestrial vegetation ecologist) faculty at University of Wyoming have agreed to join as co-authors on the conceptual models chapter. CESU task agreements will be negotiated with Patten, Hall and Tinker for these services.
- 6.2 Complete literature review. Continue to prepare annotated bibliography for selected references to be used in the VSM plan.
- 6.3 Assemble lists of ecological indicators and ask participants in Delphi III to rank order indicators and to arrive at a selection of candidate vital signs. Allow participants to add indicators to the list (for future reference).
- 6.4 Conduct park specific workshops to review, discuss and add to indicators in Delphi III. Discuss legal and regulatory monitoring requirements, management objectives and current monitoring efforts and how these can be integrated with VSP.
- 6.5 Prepare a monitoring 'strawman' proposal comprised of prioritized candidate indicators selected to date. Explain in a short 'monitoring objective' paragraph what is it that we want to monitor and why? Present and refine proposal with TPC prior to Vital Signs workshop.
- 6.6 Hold VS workshop to present and review strawman VSM proposal to a broad audience of internal and external scientists and managers. Break into subject area workgroups to draft monitoring objectives as a workshop product. Prepare workshop report.
- 6.7 Hold network meeting (with SC) to review and critique proposed vital signs and monitoring objectives before presenting the final selection to the Board of Directors.
- 6.8 Park Management Reviews: Solicit input from park resource managers and superintendents on selected vital signs and monitoring objectives through their participation in VS workshops and regular briefings.

**7 Summarize and analyze existing information and concepts important for assessing current and future monitoring efforts and needs in the network parks.**

- 7.1 Prepare synoptic reviews on vital signs monitoring themes to evaluate monitoring approaches to determine whether or not current monitoring is meeting the needs of park managers by providing reliable and credible data to help park management; evaluate data sets and recommend opportunities for further analysis; describe protocols being used and make recommendations for potential applications; describe opportunities for integration with park monitoring programs; and describe opportunities for new partnerships. The writer/editor (see task 5.1) will prepare the synoptic review on threatened and endangered species. In the second quarter of the FY, the network will develop a task agreement with a geo-thermal scientist to complete a synoptic review and to help develop conceptual models for geo-thermal ecosystems. The remaining

topics will be determined following the vital signs workshop in May. The network will find and develop task agreements with Principle Investigators through the CESU network

- 7.2 With the help of Kathy Tonnessen, contract with David Selkowitz for climate data analysis (per his existing professional services contract with RM-CESU) and with USGS (Interagency Agreement, Don Campbell) to collect and analyze air quality and deposition data for the three network parts. Kathy will serve as network contact on these projects and will oversee the initiation, progress and completion of these projects.
- 7.3 Complete task agreements through the RM-CESU to obtain the services of experts to complete synoptic reviews.
- 7.4 Prepare narrative report of Paleo resources in the network parks. Help fund seasonal employee duty stationed at Fossil Beds NP for 3.5 pay periods to complete this report for the network.

## **FY03 SCHEDULED ACTIVITIES FOR WATER QUALITY MONITORING PROGRAM**

- 8 Summarize and analyze existing information and concepts important for assessing current and future water quality monitoring efforts and needs in the network parks.
  - 8.1 Formalize GRYN network core water quality working work-group (O'Ney, Gianakos, Arnold, Tonnessen); communicate via conference calls, e-mails, etc. to collaborate on progress towards successful implementation of FY03 workplan. Jeff Arnold, aquatic ecologist YELL (term appointment) will serve on the workgroup and assist Sue O'Ney (work group team leader) by preparing written sections of the water quality monitoring plan, review and critique water quality study plans and oversee the YELL based water quality project activities identified in task 10.
  - 8.2 Complete Woods Report and data analysis. Assemble intermediate products (Woods Report, 303d lists, ONRW's, other park identified water bodies, park identified WQ stressors, etc.) and disseminate to park natural resource staff, TC and SC to bring staff up to date on the progress and science of water quality vital signs identification.
- 9 Implement and maintain an integrated GIS and data management program for water quality data.
  - 9.1 Conduct data mining, database review, and compilation and analysis of existing water quality data.
  - 9.2 Continue to incorporate new water quality datasets from ongoing research activities into Dataset Catalog, NatureBib, etc.
  - 9.3 Coordinate with data manager to develop Standard Operating Procedures (SOPs) for efficiently capturing these data in the GRYN.
  - 9.4 Insure that all Network-supported water quality data utilize the water quality database template developed by NPS/WRD.
- 10 Identify and prioritize all water quality indicators; develop/review/evaluate protocols; and implement programs to monitor the Vital Signs.
  - 10.1 Identify and implement pilot projects based on previous workshop recommendations. This will include one or more (depending on total cost and quality of pre-proposal) projects such as protocol development, synoptic studies, technical assistance requests for study plans, statistical frameworks/designs, etc. Present selected project work plans to core water quality work group along with invited advisors/participants for peer review prior to implementation.
  - 10.2 Review pilot studies (if implemented). Distribute information to core water quality work group along with invited advisors/participants for review. Incorporate results into Monitoring Plan.
  - 10.3 Develop several Fee Demo or other NRPP proposals to augment knowledge of Network water resources, possibly fund equipment purchases, conduct synoptic studies, etc.
  - 10.4 Hold a water quality-planning workshop to help formulate questions to be answered. Link previously identified ecologically significant indicators and stressors (related to water quality



within network parks) to refined Network conceptual models, incorporating results from Delphi III. Use these linkages to develop a strategic and ecologically meaningful group of monitoring objectives for water quality.

10.5 Prepare draft water quality monitoring objectives ("strawman" monitoring proposal) for peer review and BOD approval.

10.6 Participate in Vital Signs workshop.

10.7 Participate in SC meeting. Develop and apply criteria for prioritizing Vital Signs.

10.8 Review/evaluate existing protocols (USGS, EPA, States) relevant to approved water quality monitoring objectives.

11 Develop and maintain strategies to share information with network parks, scientists, and others interested in the network's I&M program.

11.1 Contact other Networks to compare water quality monitoring strategies. Encourage Network parks to utilize the water quality database template being developed by WRD for non-vital signs related water quality data being collected to allow better sharing of information.

### **III. Staffing**

#### Inventory and Monitoring Staff

Cathie Jean, Greater Yellowstone Network I&M Program Manager	GS 12/13
Laura Gianakos, Ecologist, Bighorn Canyon National Recreation Area	Term GS 9/11
Susan O'Ney, Hydrologist, Grand Teton National Park (0.5 FTE)	GS 9/11
Chad Jacobson, Cartographic Technician, Greater Yellowstone Network	Term GS 7

#### Board of Directors (until November 22, 2002)

Tom Olliff (Acting for John Varley)	Yellowstone National Park
Rick Lasko	Bighorn Canyon National Recreation Area
Steve Cain	Grand Teton National Park
Mike Britten	Intermountain Region I&M Coordinator
Kathy Tonnessen	Rocky Mountain Cooperative Ecosystem Studies Unit

#### Board of Directors (beginning November 22, 2002)

Steve Martin, Superintendent	Grand Teton National Park
Frank Walker, Assistant Superintendent	Yellowstone National Park
Bob Byrne, Assistant Superintendent (Acting for Darrel Cook)	Bighorn Canyon NRA
Mike Britten	Intermountain Region I&M Coordinator
Kathy Tonnessen	Rocky Mountain Cooperative Ecosystem Studies Unit

#### Technical Planning Committee (until November 22, 2002)

Ann Rodman	Yellowstone National Park
Susan O'Ney	Grand Teton National Park
Laura Gianakos	Bighorn Canyon National Recreation Area
Kathy Tonnessen	Rocky Mountain Cooperative Ecosystem Studies Unit
Mike Britten	Intermountain Region I & M Coordinator
Cathie Jean	I & M Program Manager, Greater Yellowstone Network

#### Technical Planning Committee (beginning November 22, 2002)

Tom Olliff	Yellowstone National Park
Ann Rodman	Yellowstone National Park
Laura Gianakos (Acting)	Bighorn Canyon National Recreation Area

Kathy Tonnessen  
Mike Britten  
Cathie Jean

Rocky Mountain Cooperative Ecosystem Studies Unit  
Intermountain Region I & M Coordinator  
I & M Program Manager, Greater Yellowstone Network

#### Science Committee

Duncan Patten	Research Professor of Ecology, Big Sky Institute, Montana State University
Lisa Graumlich	Executive Director, Big Sky Institute for Science and Natural History, Montana State University
Michael Ivie	Affiliate Director, Department of Entomology, Montana State University
Joel Berger	Senior Field Ecologist, Wildlife Conservation Society
Timothy Kittel	The Institute of Arctic and Alpine Research, , University of Colorado

#### Cooperators

Dr. Scott Woods, University of Montana -Water Quality Data Mining and VSM Recommendations (FY 02 and 03)  
Dr. Ed Krumpe & Dr. Troy Hall, University of Idaho – Delphi, A Survey of Science Professionals (FY 02 and 03)  
Dr. Bruce Maxwell & Dr. Lisa Rew, Montana State University - Exotic Plant Distribution YELL Northern Range (FY 02 and 03)  
Dr. Gary Beauvais University of Wyoming - Bat and Small Mammal Inventories (FY 02 and 03)  
Mr. Pete Bengeyfield, USDA Beaverhead-Deerlodge NF – GYCC Stream Reference Reach Delineation (FY02)  
Mr. Rob Gipson, WY Game & Fish - Fish Inventory of Alpine Lakes in GRTE (FY 02 and 03)  
Dr. Charles Peterson, Idaho State University - Amphibian & Reptile Inventory (FY 02 and 03)  
Dr. Lisa Graumlich, Montana State University - VSM Planning and Support (FY 02 and 03)  
Dr. Duncan Patten, Montana State University – Conceptual Model Development (FY 02 and 03)  
Dr. Bob Hall, University of Wyoming, - Aquatic Conceptual Model Development (FY 03)  
Dr. Dan Tinker, University of Wyoming – Forest Ecosystems Conceptual Model Development (FY 03)  
Don Campbell, USGS – WRD – Air Quality and Deposition Data Analysis (FY 03)  
David Selkowitz, Contractor – Compilation and analysis of snow and climate data (FY 03)

#### Park Contributors

Dr. Suzanne Morstad, NPS BICA, Exotic Plant Inventories and NPSpecies (FY02)  
Ms. Sue Wolff, NPS-GRTE - Bald Eagle & Sage Grouse Surveys GRTE  
Mr. Jeff Arnold, NPS-YELL – Evaluation of Stream Quality Using Benthic Macroinvertebrate Communities as Biological Indicators (FY 02) and water quality work group planning participant (FY03)  
Ms. Ann Rodman NPS-YELL – Boundary Stressors Data Collection (mining and exploration)  
Mr. Steve Haynes, NPS-GRTE - Exotic Plant Distribution –GRTE

## IV. Public Interest Highlights

The network wide FY 02 amphibian and reptile inventory efforts were a significant component of the Biological Inventory program. In both Yell and GRYN surveys occurred mostly in remote, previously unsurveyed backcountry areas. A new Boreal Toad breeding sites, a species, which has suffered dramatic declines in its western U.S. range, were found despite recent and persistent drought conditions. However, a Columbia Spotted Frog die-off was recorded at a site near Fishing Bridge, affecting large numbers of adult frogs in late summer and raising concerns about both the proximity of a sewage treatment plant to the site and the seriousness of a disease driven die-off, which could possibly correspond to a larger trend. The cause is under investigation by the USGS National Wildlife Health Center in Madison, WI. Also, Tiger Salamanders failed to breed at Rainy Lake in northern Yellowstone, where they have been observed for the past several years and where several diseased individuals were observed in 2001. In Grand Teton, the return of beavers to the Schwabacker amphibian monitoring site resulted in an increase in amphibian habitat and total numbers of Boreal Toads and Columbia Spotted Frogs. However, no Northern Leopard Frogs have been found despite repeated surveys in their historical areas of occupancy in both Grand Teton and southwestern Yellowstone.

The Valley Garter Snake, a species of highly restricted distribution in the GYE, was observed during amphibian surveys near the northern border of Grand Teton and in the Bechler area of Yellowstone, the only areas where it has been previously documented. The Northern Sagebrush Lizard, also restricted in distribution, was observed in the Norris Geyser Basin and along the Yellowstone River near Gardiner, affirming the species' continued presence in these areas.

Surveys of amphibians and reptiles in BICA resulted in observations of 14 of the 16 species known to occur in Bighorn Canyon. One amphibian species, the Tiger Salamander, which was documented in 1982 and 1985, was not observed during our surveys. Also, one reptile species, the Pale Milk Snake, which has been documented as occurring in BICA, was not detected. Other amphibian species that have undergone significant declines in parts of Wyoming and Montana, such as Woodhouse's Toads and Northern Leopard Frogs, had a limited distribution in BICA, but were found to be common at sites where they did occur. Common Sagebrush Lizards, Gopher Snakes and Western Rattlesnakes were the most frequently encountered reptile species and were widely distributed and abundant. Other species, such as both Snapping and Spiny Softshell Turtles were uncommon and with spotty distributions.

Another highlight of the FY 02 inventory season was the field measurement of stream reference reaches in GRYN parks and the classification of measured reaches into Rosgen stream-channel types. While both GRTE and BICA do not maintain many streams typically used in reference reach studies and had many reaches described as non-reference, all three parks were surveyed for a total of 88 reaches. Whether reference or non-reference, the data will be very useful when implementing the WQM Program.

Other FY 02 successes include the following:

- The GRYN was successful in leveraging inventory and monitoring funds with such regional groups as the Greater Yellowstone Coordinating Committee, the USDA Forest Service and the State of Wyoming.
- The three network parks put together a highly rated proposal to fund the Greater Yellowstone Learning Center. Funding for a Research Administrator and Education Specialist is expected in FY 04.
- The GRYN was the first IMR I&M network to form a Science Committee.

- An article in the Jackson Hole Guide recently cited the GRYN as contributing to the area's "war on weeds". The network's financial support for GRTE's non-native plant mapping project has aided in the success of local weed eradication efforts. The article noted the significance of the National Parks Omnibus Management Act of 1998 to the I&M program. This act is of local significance due to the fact that Senator Craig Thomas (WY) sponsored this legislation.
- The GRYN funded a Remote Automated Weather Station at Bighorn Canyon, allowing for weather data collection in all three GRYN parks. Historically, there has been a defined need for climate data from this region of Wyoming and Montana. This new data will significantly increase understanding of ecological systems at BICA while also greatly enhancing the forecasting ability of the National Weather Service in Billings, Montana.

## V. Reports, Publications and Presentations

### Reports

- Baum, Ryan.E., Peterson, Charles R. 2002. 2001 Progress report of occurrence, distribution, and habitat relationships of amphibians and reptiles in Bighorn Canyon. 89 pages.
- Cameron, Lane, Keinath, Doug. 2002. Bat and Terrestrial Mammal Inventories in the Greater Yellowstone Network (GRYN): Study Work Plan. (July 2002).
- Cameron, Lane, Rew, Lisa. 2002. Non-native Plants Survey of Greater Yellowstone Inventory and Monitoring Network (GRYN): Study Plan.
- Patla, Debra. 2002. Amphibian and Reptile Monitoring – Grand Teton and Yellowstone National Parks, 2001.
- Patten, Duncan., Schmitz, Danine. 2002. Ecosystem Conceptual Models for Bighorn Canyon National Recreation Area, Grand Teton National Park, and Yellowstone National Park.
- Rew, Lisa et al. 2001. Development of a sampling methodology to create an inventory for non-native weeds, within the northern range of Yellowstone National Park.
- Woods, Scott and Jennifer Corbin, University of Montana, School of Forestry, June 2002. Water Quality Summary Handouts for BICA, GRTE and YELL.

### Presentations

- ♦ October 2001 - Yellowstone NP. Ecosystem models and sub-models for Vital Signs Monitoring. Frank Walker, Assistant parks superintendent present.
- ♦ February 2002 - Grand Teton NP. Topics include Vital Signs Monitoring. GRTE staff participated in the discussion.
- ♦ June 2002 - Missoula MT. Topics include review of Delphi II results and planning for annotated literature review.
- ♦ July 2002 - Bozeman MT. Co-sponsored with USGS NRMSC. Topics include park superintendent view and discussion of USGS / NPS research and monitoring in Yellowstone NP. Suzanne Lewis was in attendance.
- ♦ September 2002 - Moose/Jackson, WY. Science Committee meeting to engage SC in the vital signs planning.
- ♦ October 2002 - Information speech at the Greater Yellowstone Coordinating Committee by Cathie Jean

## VI. Status of Park Vital Signs Monitoring

<b>Greater Yellowstone Network</b>	Air Quality	Water Quality	Water Quantity	Geologic Resources	Plants	Animals	Landscape Characteristics
<b>Planning and Design</b>							

# parks monitoring w/ NRC funding	3	3	3	3	3	3	3
# parks monitoring w/ other funding	3	3	0	1	3	3	1
<b>Protocols Implemented</b>							
# parks monitoring w/ NRC funding	0	0	0	0	0	0	0
# parks monitoring w/ other funding	2	3	1	1	3	2	2
<b>Analysis/Synthesis Available</b>							
# parks monitoring w/ NRC funding	0	0	0	0	0	0	0
# parks monitoring w/ other funding	2	3	1	1	3	2	2